

GMAT Word Problems: Challenge

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1 Introduction

This document contains nothing but difficult GMAT Word Problems questions—100 of them, to be exact. There's nothing inherently difficult about a word problem, but very few GMAT word problems are very easy. The biggest challenge most students face is translating the word problem to an algebra problem (or whatever content area it is). The math may not be hard, but getting to the point where you can do the math takes practice.

As in all of my GMAT preparation resources, you'll find these questions indexed by difficulty. That doesn't mean you should skip straight to the hardest questions, or even that you should start with the easier ones. On the GMAT itself, questions won't come labeled with their difficulty level, and despite the intent of the adaptive algorithm, they won't be precisely consistent in terms of difficulty either. Each question presents its own unique challenges, and the sooner you get accustomed to changing gears with every single question, the more time you'll have to prepare for that particular challenge of the exam.

For further, more specific practice, I have produced several other resources that may help you. There are many word problems in nearly all of my practice sets, but you'll find the most in "Rates, Ratios, and Percents," and "Problem Solving: Challenge." There are also many tricky ones in "Algebra: Challenge," in particular several that have variables in the answer choices.

Also, The GMAT Math Bible has several chapters (along with focused practice) on just about every type of word problem, including individual chapters on ratios, rates, averages, weighted averages, overlapping sets, probability, permutations, combinations, and much more. If you find you are struggling with the mechanics of these problems, your time is probably better spent with the GMAT Math Bible than in doing dozens and dozens of practice problems, hoping to pick up those skills along the way.

If you find yourself having problems with only the most difficult questions, you might try my "Extreme Challenge" set, which contains only 720 and higher level questions, many of which are word problems.

As far as strategy is concerned, there are dozens of articles at GMAT HACKS to help you with your strategic approach to Arithmetic questions. Most importantly, you should make sure you understand every practice problem you do. It doesn't matter if you get it right the first time—what matters is whether you'll get it right the next time you see it, because the next time you see it could be on the GMAT.

With that in mind, carefully analyze the explanations. Redo questions that took you too long the first time around. Review questions over multiple sessions, rather than cramming for eight hours straight each Saturday. These basic study skills may not feel like the key to GMAT preparation, but they are the difference between those people who reach their score goals and those who never do.

Enough talking; there are 100 Word Problems questions waiting inside. Get to work!

2 Difficulty Levels

In general, the level 5 questions in this guide are 560- to 620-level questions. The level 6 questions represent a broad range of difficulty from about 620 to 720, while the level 7 questions are higher still.

Moderately Difficult (5)

PS

1, 4, 5, 6, 18, 22, 27, 29, 30, 33, 39, 52, 54, 55, 59

DS

62, 66, 71, 76, 81, 82, 83, 86, 96

Difficult (6)

PS

2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 23, 25, 26, 28, 31, 32, 34,
36, 37, 38, 40, 41, 44, 45, 48, 49, 50, 53, 57, 58, 60

DS

61, 63, 64, 65, 67, 68, 72, 73, 74, 75, 77, 78, 80, 84, 85, 87, 88, 90, 91, 92, 94,
95, 97, 99, 100

Very Difficult (7)

PS

3, 24, 35, 42, 43, 46, 47, 51, 56

DS

69, 70, 79, 89, 93, 98

3 Problem Solving

Note: this guide contains both an answer key (so you can quickly check your answers) and full explanations.

1. One computer can upload 100 megabytes worth of data in 6 seconds. Two computers, including this one, working together, can upload 1300 megabytes worth of data in 42 seconds. How long would it take for the second computer, working on its own, to upload 100 megabytes of data?
 - (A) 6
 - (B) 7
 - (C) 9
 - (D) 11
 - (E) 13
2. A club offers five different levels of membership, each of which requires a membership fee y dollars greater than that of the next lowest level of membership. If the fee required for the lowest level of membership is x dollars, which of the following represents the fee required for the highest level of membership?
 - (A) $x + 4y$
 - (B) $x + 5y$
 - (C) $4x + y$
 - (D) $5x + y$
 - (E) $5(x + y)$
3. In how many arrangements can a teacher seat 3 girls and 3 boys in a row of 6 seats if no two children of the same gender are to be adjacent?
 - (A) 6
 - (B) 12
 - (C) 36
 - (D) 72
 - (E) 144

3. *PROBLEM SOLVING*

4. Rhonda invested \$25,000 in a mutual fund account exactly three years ago. The value of the account increased by 20 percent during the first year and decreased 10 percent during each of the next two years. What is the value of the account today?
- (A) \$25,750
(B) \$25,700
(C) \$25,000
(D) \$24,300
(E) \$24,250
5. The regular price of a pay-per-view program provided by a certain cable company is \$7.95. If the regular price is discounted 15 percent when 3 or more pay-per-programs are purchased in a calendar month, approximately how much more does it cost to purchase 3 pay-per-view movies than 2 pay-per-view movies?
- (A) \$7.95
(B) \$6.75
(C) \$6.65
(D) \$4.95
(E) \$4.35
6. Mary's annual income is \$15,000 and John's annual income is \$18,000. By how much must Mary's annual income increase so that it constitutes 55% of Mary and John's combined income?
- (A) \$3,000
(B) \$4,000
(C) \$7,000
(D) \$11,000
(E) \$25,000
7. A commuter drives M miles per hour for H hours, then rides a bus that travels N miles per hour for the same number of hours. Which of the following represents the commuter's average speed, in miles per hour, for the entire trip?
- (A) $\frac{M+N}{H}$
(B) $\frac{M+N}{2H}$
(C) $MH + NH$
(D) $\frac{M+N}{2}$
(E) $\frac{H(M+N)}{2}$

3. *PROBLEM SOLVING*

8. The ratio, by volume, of bleach to detergent to water in a certain solution is 2 : 40 : 100. The solution will be altered so that the ratio of bleach to detergent is tripled while the ratio of detergent to water is halved. If the altered solution will contain 300 liters of water, how many liters of detergent will it contain?
- (A) 9
(B) 20
(C) 30
(D) 60
(E) 90
9. Decreasing the original price of an item by 25% and then decreasing the new price by $z\%$ is equivalent to decreasing the original price by
- (A) $0.25(1 + \frac{3z}{100})$
(B) $0.25(1 + \frac{z}{100})$
(C) $0.25(1 - \frac{3z}{100})$
(D) $0.75(1 - \frac{z}{100})$
(E) $0.75(1 + \frac{3z}{100})$
10. Of the 50 electronics components that a factory must manufacture, 70 percent would be most efficiently manufactured by Machine A and the remaining 30 percent would be most efficiently manufactured by Machine B, though either machine could manufacture any of the 50 components. If 36 percent of the components were manufactured by Machine A and the remainder were manufactured by Machine B, what is the highest possible number of components that were manufactured by the machine that would manufacture them the most efficiently?
- (A) 30
(B) 32
(C) 33
(D) 35
(E) 36

3. *PROBLEM SOLVING*

11. One hour after Conor started walking from A to B, a distance of 37 miles, Hannah started walking along the same road from B to A. If Conor's walking rate was 2 miles per hour and Hannah's was 5 miles per hour, how many miles had Hannah walked when they met?
- (A) 10
(B) 17.5
(C) 18.5
(D) 25
(E) 27
12. In the first week of February, a bookseller sold x copies of a new arrival for the retail price $\$y$ per copy. The following week, she sold 50% fewer copies, each at a discounted rate of 20% off the retail price. In terms of x and y , what was her total revenue from both weeks of selling the new arrival?
- (A) $0.1xy$
(B) $0.4xy$
(C) $0.6xy$
(D) $1.1xy$
(E) $1.4xy$
13. A certain office building houses five departments of the same company and exactly 75 employees. If the numbers of employees working in the departments are consecutive odd numbers, what is the probability that a given employee works in one of the two largest departments?
- (A) 48%
(B) 45%
(C) 44%
(D) 40%
(E) 32%
14. A certain stationary store arranges notebooks on display such that each of the seven different colors of notebooks—white, yellow, orange, green, red, blue, and purple—are consecutive in a repeating pattern. If eight consecutively displayed notebooks are purchased, what is the probability that two of the notebooks are purple?
- (A) $\frac{1}{49}$
(B) $\frac{1}{8}$
(C) $\frac{1}{7}$
(D) $\frac{2}{7}$
(E) $\frac{1}{2}$

3. *PROBLEM SOLVING*

15. If two fair six-sided dice are thrown, what is the probability that the sum of the numbers showing on the dice is 7?
- (A) $\frac{1}{36}$
(B) $\frac{1}{12}$
(C) $\frac{1}{9}$
(D) $\frac{1}{6}$
(E) $\frac{1}{4}$
16. On a certain highway, 3% of drivers are ticketed for exceeding the speed limit. However, 80% of the drivers who exceed the speed limit are not ticketed. What percent of drivers on this highway exceed the speed limit?
- (A) 12%
(B) 15%
(C) 17%
(D) 60%
(E) 75%
17. A computer program compiled a list of number of kilobytes in each of 100 files and computed the mean, median, and standard deviation of the list. If the largest of the files were to be increased by 5 kilobytes and the smallest of the files were to be decreased by the same amount, which of these three statistics would change?
- (A) The mean only
(B) The median only
(C) The standard deviation only
(D) The mean and the median
(E) The mean and the standard deviation
18. If the number of copies sold of a certain book in its second year of publication was $\frac{1}{6}$ the number of copies sold in its first year of publication and the number of copies sold in its third year of publication was three times the number of copies sold in its second year, then the number of copies sold the first year was how many times the average (arithmetic mean) of the number of copies sold in its second and third years of publication?
- (A) $\frac{1}{3}$
(B) $\frac{1}{2}$
(C) 2
(D) 3
(E) 6

3. *PROBLEM SOLVING*

19. A certain class consists of 8 students, including Kim. Each day, three tasks must be completed and are assigned as follows: one of the 8 students is selected at random to complete Task A, one of the remaining 7 students is selected at random to complete Task B, and one of the remaining six students is selected at random to complete Task C. What is the probability that Kim will be selected to complete one of the three tasks?
- (A) $\frac{1}{3}$
(B) $\frac{3}{8}$
(C) $\frac{1}{24}$
(D) $\frac{1}{336}$
(E) $\frac{1}{512}$
20. 20 minutes after train A leaves City X for City Y, a distance of 220 miles, train B leaves City Y for City X on the same track. If train A's average speed is 60 miles per hour and train B's average speed is 40 miles per hour, how far will train B have traveled when the two trains meet?
- (A) 80
(B) 100
(C) 110
(D) 120
(E) 140
21. A research study found that, of 500 people surveyed, 220 watched neither Network A nor Network B, 120 watched only Network A, and for every person who watched both networks, 3 watched only Network B. How many of the 500 people surveyed watched both networks?
- (A) 40
(B) 60
(C) 80
(D) 100
(E) 120

3. *PROBLEM SOLVING*

22. Shelley invested \$10,000 in a mutual fund account exactly three years ago. The value of the account increased by 20 percent during the first year, decreased by 5 percent the second year, and increased by 10 percent in the third year. What is the value of the account today?
- (A) \$12,700
(B) \$12,630
(C) \$12,540
(D) \$12,500
(E) \$12,450
23. To qualify for federal funding, a local school district must keep their ratio of certified teachers to non-certified teachers above 9 : 2. If the school district employs a total of 600 teachers, what is the maximum number of non-certified teachers they can employ and qualify for federal funding?
- (A) 99
(B) 109
(C) 111
(D) 116
(E) 133
24. A closed cylindrical tank contains 20π cubic feet of water and is filled to half its capacity. When the tank is placed upright on its circular base on level ground, the height of the water in the tank is 5 feet. When the tank is placed on its side on level ground, what is the height, in feet, of the surface of the water above the ground?
- (A) 1
(B) 1.5
(C) 2
(D) 2.5
(E) 3

3. *PROBLEM SOLVING*

25. Among a group of 1,500 people, 44 percent invest in mutual funds, 22 percent invest in blue-chip stocks, and 12 percent invest in both mutual funds and blue-chip stocks. If 1 person is to be randomly selected from the 1,500 people, what is the probability that the person selected will be one who invests in blue-chip stocks but NOT in mutual funds?
- (A) $\frac{1}{10}$
(B) $\frac{3}{25}$
(C) $\frac{11}{50}$
(D) $\frac{8}{25}$
(E) $\frac{11}{20}$
26. Jack walks R blocks in M minutes, then rides a bus six times as many blocks in N minutes. Which of the following represents Jack's average speed, in blocks per minute, for the entire trip?
- (A) $\frac{6R}{M+N}$
(B) $\frac{7R}{M+N}$
(C) $\frac{7R}{MN}$
(D) $\frac{12R}{M+N}$
(E) $\frac{14R}{M+N}$
27. Last year Company X spent 15% of its revenues on employee health care expenses. This year Company X's revenues were 20% greater, and it spent 10% of its revenue on employee health care expenses. The amount Company X spent on health care expenses last year is what percent greater than it spent this year?
- (A) 15
(B) 20
(C) 25
(D) $33\frac{1}{3}$
(E) 50

3. *PROBLEM SOLVING*

28. A certain board game has a row of squares numbered 1 to 100. If a game piece is placed on a random square and then moved 7 consecutive spaces in a random direction, what is the probability the piece ends no more than 7 spaces from the square numbered 49?
- (A) 7%
(B) 8%
(C) 14%
(D) 15%
(E) 28%
29. Of the pieces of fruit in a fruit salad, $\frac{1}{10}$ are oranges, $\frac{1}{5}$ are apples, $\frac{1}{2}$ are peaches, and the remaining 8 pieces are grapes. What is the number of oranges in the fruit salad?
- (A) 2
(B) 4
(C) 8
(D) 10
(E) 20
30. The central banker of Country X predicts that, next year, exports of agricultural goods will increase by 20 percent and exports of industrial goods will increase by 25 percent. This year, total exports of agricultural goods were \$9.9 million and exports of industrial goods were \$24 million. According to the central banker's prediction, what will be next year's total of agricultural and industrial exports?
- (A) \$40,680,000
(B) \$41,175,000
(C) \$41,527,500
(D) \$41,880,000
(E) \$42,375,000
31. In a statewide poll, Y people were asked two questions, the only answers to which were "yes" or "no." If $\frac{3}{4}$ of them answered "no" to question 1, and $\frac{2}{3}$ of those answered "yes" to question 2, which of the following expressions represents the number of people interviewed who did not answer "no" to both questions?
- (A) $\frac{Y}{12}$
(B) $\frac{Y}{4}$
(C) $\frac{Y}{2}$
(D) $\frac{3Y}{4}$
(E) $\frac{11Y}{12}$

3. *PROBLEM SOLVING*

32. If $\frac{1}{2}$ the water in a pool is removed every five minutes that a drainage pipe is in operation, what fraction of the original amount of water has been removed after twenty minutes?
- (A) $\frac{15}{16}$
(B) $\frac{7}{8}$
(C) $\frac{1}{4}$
(D) $\frac{1}{8}$
(E) $\frac{1}{16}$
33. Airplanes A and B traveled the same 360-mile route. If airplane A took 2 hours and airplane B traveled at an average speed that was $\frac{1}{3}$ slower than the average speed of airplane A, how many hours did it take airplane B to travel the route?
- (A) 2
(B) $2\frac{1}{3}$
(C) $2\frac{1}{2}$
(D) $2\frac{2}{3}$
(E) 3
34. Vial V is $\frac{2}{3}$ full of a certain solution and vial W, which has 50% more capacity than vial V, is $\frac{3}{4}$ full of the same solution. If half of the solution in vial V is poured into vial W, vial W will be filled to what fraction of its capacity?
- (A) $\frac{27}{36}$
(B) $\frac{10}{11}$
(C) $\frac{11}{12}$
(D) $\frac{23}{24}$
(E) $\frac{35}{36}$
35. The inside dimensions of a rectangular wooden box are 4 meters by 5 meters by 6 meters. A cylindrical drum is to be placed inside the box so that it stands upright when the closed box rests on one of its six faces. Of all such drums that could be used, what is the volume, in cubic meters, of the one that has maximum volume?
- (A) 20π
(B) 24π
(C) 25π
(D) 96π
(E) 100π

3. *PROBLEM SOLVING*

36. In a certain physics class, the ratio of the number of physics majors to non-physics majors is 3 to 5. If two of the physics majors were to change their major to biology, the ratio would be 1 to 2. How many physics majors are in the class?
- (A) 16
(B) 18
(C) 24
(D) 30
(E) 32
37. Of the stocks on a certain index in 1993, 60 percent paid a dividend, 55 percent increased in price by 10% or more, and 25 percent neither paid a dividend or increased in price by 10% or more. What percent of the stocks on the index paid a dividend and increased in price by 10% or more?
- (A) 20
(B) 25
(C) 30
(D) 35
(E) 40
38. A store currently charges the same price for each compact disc that it sells. If the current price of each compact disc were to be increased by \$2, 3 fewer of the compact discs could be bought for \$180, excluding sales tax. What is the current price of each compact disc?
- (A) \$8
(B) \$9
(C) \$10
(D) \$12
(E) \$18
39. If the approval rating of a certain politician is 20% lower in April than her approval rating in February and her approval rating in June is 10% lower than her approval rating in April, then the average (arithmetic mean) of her approval rating in April and June was what percent of her approval rating in February?
- (A) 76%
(B) 72%
(C) 70%
(D) 30%
(E) 24%

3. *PROBLEM SOLVING*

Class	Men	Women	Total
F	x	y	33
G	y	z	37
H	x	z	28

40. The table above shows the number of men, women, and total students in each of three classes, what is the number of men in class G ?
- (A) 12
(B) 16
(C) 18
(D) 20
(E) 21
41. A research study determined that, of 350 households surveyed, 115 used neither Brand A or Brand B toothpaste, 85 used only Brand A toothpaste, and for every 3 households that used only Brand B toothpaste, 2 households used both brands of toothpaste. How many of the 350 households surveyed used only Brand B toothpaste?
- (A) 50
(B) 60
(C) 75
(D) 90
(E) 100
42. Each card in a deck has an integer written on it, and the integers on each of the 12 cards in the deck are consecutive. In a certain game, the number points awarded for each turn is determined by drawing two cards and multiplying the numbers shown on the cards. If the points awarded in three turns are 40, 72, and 60, all of the following could be the smallest numbered card in the deck EXCEPT:
- (A) -1
(B) 0
(C) 4
(D) 5
(E) 6

3. *PROBLEM SOLVING*

43. Three alcohol solutions are 1 percent, 3 percent, and 6 percent by volume. If a ounces of the 1 percent solution, b ounces of the 3 percent solution, and c ounces of the 6 percent solution are mixed to give $a + b + c$ ounces of a 2 percent solution, what is a in terms of b and c ?
- (A) $\frac{b+c}{5}$
(B) $b + 4c$
(C) $2b + 5c$
(D) $3c + 6b$
(E) $c + 1.5b$
44. Eight machines, each working at the same constant rate, together can complete a certain job in 9 days. How many additional machines, each working at the same constant rate, will be needed to complete the job in 6 days?
- (A) 1
(B) 3
(C) 4
(D) 6
(E) 12
45. Yolanda drove at an average speed of x miles per hour for the first 50 miles of a trip and then at an average speed of $2x$ miles per hour for the remaining 50 miles of the trip. If she made no stops during the trip, what was Yolanda's average speed, in miles per hour, for the entire trip, in terms of x ?
- (A) $\frac{7}{6}x$
(B) $\frac{4}{3}x$
(C) $\frac{3}{2}x$
(D) $\frac{5}{3}x$
(E) $\frac{11}{6}x$
46. A certain academic department consists of 3 senior professors and 6 junior professors. How many different committees of 3 professors can be formed in which at least one member of the committee is a senior professor? (Two groups are considered different if at least one group member is different.)
- (A) 168
(B) 127
(C) 66
(D) 64
(E) 36

3. *PROBLEM SOLVING*

47. At a meeting, 6 people are to be seated around a circular table. Two seating arrangements are considered different only when the positions of the people are different relative to each other. What is the total number of different possible seating arrangements for the group?
- (A) 12
(B) 72
(C) 120
(D) 144
(E) 720
48. A certain car dealership is selling five cars for the following prices: \$12,000, \$13,500, \$14,000, \$16,400, and \$17,800. If the price of the most expensive car is increased by \$1,200, which of the following statements best describes the change in the mean and the median of the car prices?
- (A) The mean and the median will remain unchanged.
(B) The mean will remain unchanged but the median will increase.
(C) The mean will increase but the median will remain unchanged.
(D) The mean and the median will increase by the same amount.
(E) The mean and the median will increase by different amounts.
49. A security guard at a certain store is instructed to check the receipt of one out of every five customers as they are leaving the store. If, on the guard's shift, 10 customers leave the store, how many different samples of customers could have been selected to have their receipts checked?
- (A) 20
(B) 45
(C) 50
(D) 90
(E) 100

3. *PROBLEM SOLVING*

50. Of the 200 math majors at a certain university, 30 percent will be assigned to advanced calculus on Monday and Wednesday and the remaining 70 percent will be assigned to advanced calculus on Tuesday and Thursday. However, 40 percent of the math majors prefer Tuesday and Thursday and 60 percent prefer Monday and Wednesday. What is the lowest possible number of math majors who will NOT be assigned to the days they prefer?
- (A) 15
(B) 20
(C) 30
(D) 45
(E) 60
51. If two fair six-sided dice are thrown, what is the probability that the sum of the numbers showing on the dice is a prime number?
- (A) $\frac{5}{11}$
(B) $\frac{5}{12}$
(C) $\frac{1}{2}$
(D) $\frac{7}{12}$
(E) $\frac{7}{9}$
52. An airline has 150 seats on each of its planes on the New York to Chicago route, and operating a one-way flight from New York to Chicago costs the airline \$22,000. If the airline is unable to sell 40 of the seats on a certain one-way flight from New York to Chicago, what is the minimum selling price per seat that will ensure that the profit on the flight (revenue from sales minus the costs of operating the flight) will be at least \$16,500?
- (A) \$150
(B) \$200
(C) \$250
(D) \$300
(E) \$350

3. *PROBLEM SOLVING*

53. A certain television show has 15 sponsors, including Company X, each of which has produced a 30-second advertisement to be televised during the show. The first commercial break will consist of 4 of these 30-second advertisements, each of which will represent a different sponsor. What is the probability that Company X's advertisement will be one of the first two shown during the first commercial break?
- (A) $\frac{1}{225}$
(B) $\frac{1}{30}$
(C) $\frac{1}{15}$
(D) $\frac{2}{15}$
(E) $\frac{4}{15}$
54. At a certain internet cafe, the charge for computer usage is \$3.75 for the first 15 minutes and \$0.50 for each 5 minutes thereafter. If Jason uses a computer at the cafe for 2 hours and Kylie uses a computer at the cafe for 1.5 hours, how much more is Jason charged than Kylie?
- (A) \$11.25
(B) \$7.50
(C) \$5.25
(D) \$3.00
(E) \$1.50
55. In a series of consecutive odd numbers, 27 is the eighth smallest number and 25 is the tenth largest number. What is the range of the series?
- (A) 32
(B) 30
(C) 28
(D) 16
(E) 14
56. A closed cylindrical tank contains 16π cubic feet of water and is filled to one-quarter of its capacity. When the tank is placed upright on its circular base on level ground, the height of the water in the tank is equal to the diameter of the tank's base. What is the radius of the tank?
- (A) 1
(B) 2
(C) $2\sqrt{2}$
(D) 4
(E) 8

3. *PROBLEM SOLVING*

57. A certain thermometer measured the temperature in City X in degrees Fahrenheit every day for one month, and found that the range of temperatures was 21 degrees. If, subsequently, it was discovered that the thermometer always overstated the temperature by 15%, what would the approximate range of measurements have been, in degrees, if the temperatures had been measured accurately?
- (A) 15
(B) 17
(C) 18
(D) 21
(E) 24
58. Last year a certain bond with a face value of \$5,000 yielded 6 percent of its face value in interest. If the bond's selling price was \$5,400, approximately what percent of its selling price did it yield in interest last year?
- (A) 5.6%
(B) 6.0%
(C) 6.5%
(D) 7.4%
(E) 11.1%
59. It takes Train A 16 minutes to travel a certain route at an average rate of 55 miles per hour. How many minutes does it take Train B to travel the same route at an average rate of 40 miles per hour?
- (A) 20
(B) 22
(C) 25
(D) 31
(E) 33
60. In a certain game, amounts of money are represented by differently colored playing cards. If 3 red cards equal 5 blue cards and 5 blue cards equal 9 green cards, how many red cards equal 12 green cards?
- (A) 2
(B) 4
(C) 6
(D) 8
(E) 9

4 Data Sufficiency

For all Data Sufficiency questions, the answer choices are as follows:

- (A) Statement (1) ALONE is sufficient, but statement (2) alone is not sufficient.
 - (B) Statement (2) ALONE is sufficient, but statement (1) alone is not sufficient.
 - (C) BOTH statements TOGETHER are sufficient, but NEITHER statement ALONE is sufficient.
 - (D) EACH statement ALONE is sufficient.
 - (E) Statements (1) and (2) TOGETHER are NOT sufficient.
61. Machines Y and Z work at their respective constant rates. If it takes machines Y and Z, working together, 12 hours to fill a production order of a certain size, how many more hours does it take machine Y, working alone, to fill the order than it takes machine Z, working alone?
- (1) Machine Z, working alone, fills a production order of this size in twice the time than machine Y, working alone, does.
 - (2) Machines Y and Z, working together, fill a production order of this size in two-thirds the time that machine Y, working alone, does.
62. Each member of a certain legislature supports only one of the two amendments V and X. Of the members, 35 percent support amendment V and the rest support amendment X. How many members of the legislature support amendment Z?
- (1) Of the members of the legislature who support amendment V, 60 percent support amendment Z.
 - (2) Of the members of the legislature who support amendment X, 12 support amendment Z.

4. DATA SUFFICIENCY

63. Bryan deposited money into two new accounts, M and N. Account M earns 6 percent simple annual interest and account N earns 10 percent simple annual interest. If Bryan deposited money into both accounts at the beginning of last year and has made no deposits or withdrawals since, then the amount of interest that account N earned in the first year was how many dollars greater than the amount of interest that account M earned in the first year?
- (1) The total amount of interest that the two accounts earned in the first year was \$900.
 - (2) The amount of interest that account M earned was half of the amount of interest that account N earned.
64. Are at least 20 percent of the students in City X employed?
- (1) In City X, 16.8 percent of the population consists of students.
 - (2) In City X, 35 percent of the students 25 years of age and older are employed and 20 percent of the students younger than 25 years of age are employed.
65. For each customer, a butcher charges y dollars for the first pound of meat purchased by the customer and charges z dollars for each additional pound purchased by the customer. What is the value of y ?
- (1) A customer who purchases 5 pounds of meat is charged \$16.00.
 - (2) A customer who purchases 2 pounds of meat is charged \$0.50 less per pound than a customer who purchases 1 pound of meat.
66. Each of the students in a certain class received a grade of A, B, or C. What percent of the students in the class were males?
- (1) Of those who receive an A, 30 percent were males.
 - (2) Of those who received either a B or C, 60 percent were females.
67. A combined total of 144 eggs are stored in two crates; of these, a total of 9 are broken. If there are exactly 5 broken eggs in the first crate, what is the number of eggs in the second crate that are not broken?
- (1) The ratio of broken eggs to eggs that are not broken is the same in both crates.
 - (2) The ratio of broken eggs to eggs that are not broken in the first crate is 1 : 15.

4. DATA SUFFICIENCY

68. Each person who attended a certain concert paid the same price for a ticket. How many people attended the concert?
- (1) If the ticket price had been \$6 more and 100 fewer people had attended the concert, the total revenues from ticket sales would have been the same.
 - (2) If the ticket price had been \$6 less and 100 more people had attended the concert, the total revenues from ticket sales would have been \$1200 less.
69. A researcher combined x ounces of an saline solution that contained 20 percent saline, by volume, with y ounces of a saline solution that contained 5 percent saline, by volume, to produce z ounces of a saline solution that was 12 percent saline, by volume. What is the value of x ?
- (1) $y = 16$
 - (2) $z = 30$
70. For the students in Mr. Smith's first-period class, the range of their test scores is x points and the highest test score is e points. For the students in Mr. Smith's second-period class, the range of their scores on the same test is y points and the highest score is f points. Is the lowest score of the students in the first-period class greater than the lowest score of the students in the second-period class?
- (1) $e < f$
 - (2) $x > y$
71. Machines X and Y run simultaneously at their respective constant rates. If machine X produces 3 mailers in 10 seconds, how many mailers do machines X and Y produce per minute?
- (1) Machine Y produces 24 mailers per minute.
 - (2) Each minute, machine Y produces 6 more mailers than machine X produces.
72. How many 360-degree rotations did a bicycle wheel make while rolling 200 meters in a straight line without slipping?
- (1) The wheel made 24 360-degree rotations per minute.
 - (2) The wheel rolled the 200-meter distance in 18 minutes.

4. DATA SUFFICIENCY

73. City X has 240,000 residents, 48 percent of whom are male. What percent of the residents were born in City X?
- (1) The number of male residents who were born in City X is half the number of male residents who were not born in City X.
 - (2) The number of female residents who were born in City X is 40 percent less than the number of male residents who were not born in City X.
74. In a certain parking lot, each row of parking spaces has the same number of spaces, and the number of rows is 3 greater than the number of spaces in a row. How many spaces are in a row?
- (1) If the last row were empty and the rest of the parking lot were full to capacity, there would be 99 spaces occupied in the parking lot.
 - (2) If exactly one space in each row were empty and the rest of the parking lot were full to capacity, there would be 96 spaces occupied in the parking lot.
75. Town T has 35,000 residents, 40 percent of whom earn at least \$50,000 per year. What percent of those who earn at least \$50,000 per year work for Company X?
- (1) 5,600 of the residents of Town T work for Company X.
 - (2) Company X has 1,800 employees who earn at least \$50,000 per year.
76. What was the ratio of the number of shares of stock X to shares of stock Y in Quinn's portfolio 60 days ago?
- (1) 60 days ago, if Quinn had purchased 13 more shares of stock X, the ratio of shares of stock X to shares of stock Y in her portfolio would be 3 : 2.
 - (2) 60 days ago, if Quinn had purchased 5% more shares of stock X, her portfolio would have contained 50% more shares of stock X than shares of stock Y.
77. After winning 30 percent of the first 50 games it played, Team A won all the remaining games it played. How many total games did Team A win?
- (1) Team A won 11 of the last 12 games it played.
 - (2) Team A won 14 of the first 48 games it played.

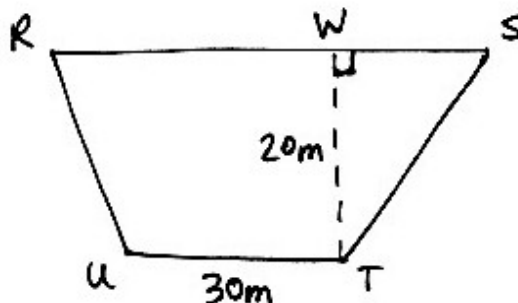
4. DATA SUFFICIENCY

78. In Adams School, each student studies Russian or Japanese or both. If 120 of the students do not study Russian, how many students study both Russian and Japanese?
- (1) 150 of the students do not study Japanese.
 - (2) In Adams School, there are a total of 400 students.
79. John owns stock in nine different companies, for a total of 21,000 shares of stock. If the number of shares he has in any company is not equal to the number of shares he has in any other company, does he own at least 3,000 shares of Company C stock?
- (1) John has more shares of Company C stock than any other company's stock, except for Company A and Company B.
 - (2) The number of shares of Company C stock that John owns is less than 20% greater than the number of shares of any other company's stock that John owns.
80. In a certain office, 40 percent of the employees are male and 50 percent of the employees have graduate degrees. If 15 percent of the male employees have graduate degrees in economics, how many of the male employees have graduate degrees in economics?
- (1) Exactly 100 of the employees have graduate degrees.
 - (2) Of the female employees, 25 percent have graduate degrees in business.
81. A certain car rental agency rented 25 vehicles yesterday, each of which was either a compact car or a luxury car. How many compact cars did the agency rent yesterday?
- (1) The daily rental rate for a luxury car was \$15 higher than the rate for a compact car.
 - (2) The total rental rates for luxury cars was \$105 higher than the total rental rates for compact cars yesterday.
82. Of the mutual funds analyzed for a certain study, 10 percent invested in both technology stocks and oil stocks. What percent of the mutual funds analyzed invested in neither technology stocks nor oil stocks?
- (1) Of those mutual funds analyzed that invested in oil stocks, one-third invested in technology stocks.
 - (2) 35 percent of the mutual funds analyzed invested in technology stocks but not oil stocks.

4. DATA SUFFICIENCY

83. If Tomas flew his aircraft from City A to City B at an average speed that was greater than 235 miles per hour, did it take him less than 3 hours to fly this distance?
- (1) The distance Tomas flew from City A to City B was between 650 and 750 miles in length.
 - (2) The distance Tomas flew from City A to City B was less than 700 miles in length.
84. The length of the outside border of circular track K is twice the length of the outside border of circular track M. Assuming that the border has negligible width, what is the area within the outside border of track M ?
- (A) The area within the outside border of track M is 12π square meters less than the area within the outside border of track K.
 - (B) The length of the outside border of track M is 2π meters less than the length of the outside border of track K.
85. In a certain investment club, 36 members invest in domestic stocks or foreign stocks or both. If 8 members do not invest in domestic stocks, how many members invest in both domestic stocks and foreign stocks?
- (1) Of the 36 members, 14 do not invest in foreign stocks.
 - (2) A total of 22 members invest in foreign stocks.
86. Leandro's final grade for a certain class will be a number between 0 and 100 equal to a fixed number of points for attendance plus a number of points that is directly proportional to the number of questions answered correctly on the final exam. If Leandro answers 120 questions correctly on the final exam, what will be his final grade?
- (1) In the same class, Minnie answered 112 questions correctly on the final exam.
 - (2) In the same class, Minnie received a final grade of 86.
87. When a player in a certain game removed a marble from a bag a certain number of times, 3 more blue marbles than red marbles resulted. The bag consisted of only blue and red marbles. How many times did a blue marble result?
- (1) A red marble resulted $\frac{3}{7}$ of the time.
 - (2) The player received 2 points each time a blue marble resulted and lost 2 points each time a red marble resulted, for a total of 6 points.

4. DATA SUFFICIENCY



88. Quadrilateral RSTU shown above is the outline of Rosa's garden in which side RS is parallel to side UT and RS is longer than UT. What is the area of Rosa's garden?
- (1) $ST = 10\sqrt{10}$ meters
 - (2) $RS = 45$ meters.
89. Whenever Hattie has a restaurant bill with an amount between \$20 and \$99, she calculates the dollar amount of the tip as the tens digit of the amount of her bill plus \$3. If the amount of Hattie's most recent restaurant bill was between \$20 and \$99, was the tip calculated by Hattie greater than 15 percent of the amount of the bill?
- (1) The amount of the bill was less than \$60.
 - (2) The tip calculated by Hattie was \$8.
90. Of the 750 math majors at a certain college, 210 have a second major and are planning on going to graduate school. How many of the 750 math majors have a second major and are not planning on going to graduate school?
- (1) 270 of the math majors at the college are planning on going to graduate school.
 - (2) 460 of the math majors at the college have a second major.
91. A car dealership carries six different models of cars. Of the 80 cars currently in stock, the dealership has different numbers of each model of car. If Model A is the model with the second greatest number of cars at the dealership, are there at least 12 Model A cars at the dealership?
- (1) The dealership has 45 cars of one of the models.
 - (2) There are fewer than 15 Model A cars at the dealership.

4. DATA SUFFICIENCY

92. In a certain marching band, 20 percent of the musicians play percussion instruments, and 50 percent of the musicians have been in the band since 1995. If 30 percent of the musicians who have been in the band since 1995 play brass instruments, how many of the musicians who have been in the band since 1995 play brass instruments?
- (1) 40 of the musicians have been in the band since 1995.
 - (2) 16 of the musicians play percussion instruments.
93. A certain 4-liter solution of water, vinegar, and alcohol consists of x liters of water, y liters of vinegar, and z liters of alcohol. How many liters of water does the solution contain?
- (1) The ratio of water to vinegar is 4 : 1.
 - (2) The ratio of vinegar to alcohol is 3 : 1.
94. If \$4,000 invested for one year at n percent simple annual interest yields \$300, what amount must be invested at x percent simple annual interest for one year to yield the same number of dollars?
- (1) $x = \frac{2n}{3}$
 - (2) $n = 7.5$
95. There are least 50 museums in City X that are open on Tuesdays. If 20 percent of the museums in City X that are open on Mondays are also open on Tuesdays, are more of the museums open in City X on Mondays than Tuesdays?
- (1) 40 museums in City X are open both Mondays and Tuesdays.
 - (2) 30 percent of the museums in City X that are open on Tuesdays are also open on Mondays.
96. In a certain classroom each row of chairs has the same number of chairs, and the number of rows is 1 greater than the number of chairs in a row. How many chairs are in a row?
- (1) There is a total of 30 chairs.
 - (2) After 1 chair is removed from the front row, there is a total of 9 chairs in the first two rows.
97. Bruce, Quentin, and Nory shared the driving on a 2,000-mile trip. Which of the three drove the greatest distance on the trip?
- (1) Bruce drove 2 hours longer than Quentin but an average rate of 10 miles per hour slower than Quentin.
 - (2) Nory drove 10 hours and averaged 65 miles per hour.

4. DATA SUFFICIENCY

98. If the standard deviation of the populations of six countries in 1987 was 8 million people, what was the standard deviation of the populations of the countries in 1997?
- (1) Each of the six countries experienced population growth of 15% between 1987 and 1997.
 - (2) The average (arithmetic mean) of the populations of the six countries in 1997 was 35 million people.
99. An empty swimming pool with a capacity of 60,000 liters is to be filled by hoses X and Y simultaneously. If the amount of water flowing from each hose is independent of the amount flowing from the other hose, how long, in hours, will it take to fill the pool?
- (1) Hose X alone would take 25% longer to fill the pool than would hose Y alone.
 - (2) It would take hose Y alone 40% as long to fill half the pool as it would take hose X alone to fill the entire pool.
100. When 200 laboratory rats were given an experimental medicine, some developed a skin rash and some developed sluggishness. How many of the laboratory rats developed sluggishness but not a skin rash?
- (1) 175 laboratory rats developed neither sluggishness nor a skin rash.
 - (2) 15 laboratory rats developed a skin rash.

5 Answer Key

For full explanations, see the next section.

1. B
2. A
3. D
4. D
5. E
6. C
7. D
8. D
9. A
10. C
11. D
12. E
13. A
14. C
15. D
16. B
17. C
18. D
19. B
20. A
21. A
22. C
23. B
24. C
25. A
26. B
27. C
28. D
29. B
30. D
31. D
32. A
33. E
34. E
35. C
36. B
37. E
38. C
39. A
40. E
41. D

5. ANSWER KEY

- 42. E
- 43. B
- 44. C
- 45. B
- 46. D
- 47. C
- 48. C
- 49. B
- 50. E
- 51. B
- 52. E
- 53. D
- 54. D
- 55. B
- 56. B
- 57. C
- 58. A
- 59. B
- 60. B
- 61. D
- 62. E
- 63. C
- 64. B
- 65. C
- 66. E
- 67. D
- 68. C
- 69. D
- 70. C
- 71. D
- 72. C
- 73. C
- 74. D
- 75. B
- 76. B
- 77. E
- 78. C
- 79. B
- 80. A
- 81. E
- 82. C
- 83. B
- 84. D
- 85. D
- 86. E
- 87. A

5. *ANSWER KEY*

- 88. B
- 89. E
- 90. B
- 91. E
- 92. D
- 93. C
- 94. A
- 95. B
- 96. D
- 97. E
- 98. A
- 99. E
- 100. C

6 Explanations

For a quick-reference answer key, see the previous section.

1. B

Explanation: This is a combined work question, so you may use the combined work formula: $\frac{AB}{A+B} = T$. A and B are times, so A is the 6 seconds for the first computer to upload 100 megabytes. T is the time working together, which must be adjusted to reflect 100 megabytes of data: $\frac{42}{13}$. So, the work formula looks like this: $\frac{6B}{6+B} = \frac{42}{13}$, where B is the time it takes the second computer to upload 100 megabytes worth of data. Solving for B , begin by cross multiplying:

$$13(6B) = 42(6 + B)$$

$$13B = 7(6 + B)$$

$$13B = 42 + 7B$$

$$6B = 42$$

$$B = 7, \text{ choice (B).}$$

2. A

Explanation: If x is the cost of the lowest level of membership, the next highest level is $x + y$. The next level above that is $(x + y) + y$, followed by $(x + y + y) + y$, and finally, the highest level:

$$(x + y + y + y) + y = x + 4y, \text{ choice (A).}$$

3. D

Explanation: Figure out how many options there are for each of the six seats. Starting at the far left, there are six options for the first seat: anyone could sit there. For the second seat, there are three options. If a boy was seated in the first seat, any of the three girls could sit in the next seat, and if a girl was seated in the first seat, any of the three boys could sit in the next seat.

For the third seat, there are two options; the child must be the same gender as the child in the first seat, and there are two of each gender remaining. There are also two options for the fourth seat: same gender as the second seat.

There is only one option each for the fifth and sixth seat. The child in the fifth seat must be the same gender as the children in the first and third, and the child in the sixth must be the same gender as the children in the second and fourth. That gives you the following numbers, which must be multiplied for the total number of arrangements:

$$6 \times 3 \times 2 \times 2 \times 1 \times 1 = 72, \text{ choice (D).}$$

4. D

Explanation: 20% of \$25,000 is $25,000(0.2) = 5,000$, so the value of the account after the first year is $25,000 + 5,000 = 30,000$. 10% of 30,000 is 3,000, so the value of the account after the second year is $30,000 - 3,000 =$

6. EXPLANATIONS

27,000. 10% of 27,000 is 2,700, so the value of the account after the third year is $27,000 - 2,700 = 24,300$, choice (D).

5. E

Explanation: The key word is "approximate," so work with a per-movie cost of \$8, not \$7.95. The discounted price of 3 movies is 15% less than $\$8(3) = \24 . 15% of 24 is the sum of 10% and 5% of 24, or 2.40 and 1.20, equal to 3.60. The discounted price, then, is $24 - 3.60 = 20.40$.

The price of purchasing two movies is not discounted, so it is simply $\$8(2) = \16 . The difference between the cost of three movies and of two movies is $\$20.40 - \$16 = \$4.40$, which is approximately the same as choice (E).

6. C

Explanation: A better way to think of this question is that John's income must constitute 45% of their combined income. His income doesn't change, so it's better to work with that. To find Mary's increased income, first find their combined income, of which John's \$18,000 is 45%:

$$(0.45)T = 18,000$$

$$\frac{9}{20}T = 18,000$$

$$T = 18,000\left(\frac{20}{9}\right) = 2,000(20) = 40,000$$

Thus, the resulting total income must be \$40,000, meaning that Mary's increased income must be $\$40,000 - \$18,000 = \$22,000$. That's an increase in income of $\$22,000 - \$15,000 = \$7,000$, choice (C).

7. D

Explanation: Average speed is total distance divided by total time. We're given total time: it's the sum of the H hours the commuter drove and the H hours he rode a bus. So total time is $2H$. Total distance requires more work.

We're given the rate and the time for part of the trip that the commuter drove. Since rate equals distance divided by time, we can solve for distance:

$$M = \frac{d}{H}$$

$$d = MH$$

We can use the same technique to find the distance of the second leg of the trip:

$$N = \frac{d}{H}$$

$$d = NH$$

Total distance is $MH + NH$, so the average speed is $\frac{MH+NH}{2H}$. We can simplify that by dividing an H out of the numerator and denominator, leaving us with $\frac{M+N}{2}$, choice (D).

Note that this is the long way to do this particular problem. When the number of hours for each leg is the same, the average speed is simply the average of the different speeds. However, if the legs were not of the same length, all of these steps are necessary.

8. D

6. EXPLANATIONS

Explanation: The current ratio of bleach to detergent is 2 : 40, so if it is tripled, the new ratio is 6 : 40 = 3 : 20. The current ratio of detergent to water is 40 : 100, so if it is halved, the new ratio is 20 : 100.

If the new solution contains 300 liters of water, we can set up a ratio to find the number of liters of detergent:

$$\frac{d}{w} = \frac{20}{100} = \frac{x}{300}$$

$$20(300) = 100x$$

$$x = 20(3) = 60, \text{ choice (D).}$$

9. A

Explanation: With an unknown value, percents, and a variable in the question stem, start picking numbers. Use 100 for the original price, and set $z = 50$. If the original price is 100, 25% less is 75, then 50% less is 37.5. 37.5 is 62.5% less than 100, so check the answer choices to see which, when $z = 50$, equals 62.5%:

$$(A) \quad 0.25\left(1 + \frac{150}{100}\right) = 0.25(2.5) = 0.625. \text{ Bingo.}$$

$$(B) \quad 0.25\left(1 + \frac{50}{100}\right) = 0.25(1.5) = 0.375. \text{ No.}$$

$$(C) \quad 0.25\left(1 - \frac{150}{100}\right) = 0.25(-0.5) = -0.125. \text{ No.}$$

$$(D) \quad 0.75\left(1 - \frac{50}{100}\right) = 0.75(0.5) = 0.375. \text{ No.}$$

$$(E) \quad 0.75\left(1 + \frac{150}{100}\right) = 0.75(2.5) = 1.875. \text{ No}$$

10. C

Explanation: If 36 percent of the components were manufactured by Machine A, it would maximize the number that are manufactured most efficiently to have all 36 percent of those components be among the 70 percent that A manufactures most efficiently.

That leaves 74 percent to be manufactured by B. 30 percent of the total are most efficiently manufactured by B, and all of those will be manufactured by B.

So, the total percent that is manufactured most efficiently is 36 (done by A) plus 30 (done by B), for a sum of 66%. There are only 50 components being manufactured, so the answer is $0.66(50) = 33$, choice (C).

11. D

Explanation: In the first hour before Hannah starts walking, Conor travels 2 miles, so the distance between them is only 35 miles. If two people are walking toward each other, they are moving together at their combined rate – that is, $5 + 2 = 7$ miles per hour. They will meet in $\frac{35 \text{ miles}}{7 \text{ mph}} = 5$ hours. In that 5 hours, Hannah will have walked $(5 \text{ hours}) \times (5 \text{ mph}) = 25$ miles, choice (D).

12. E

Explanation: With variables in the question stem and answer choices, pick numbers. Say $x = 10$ and $y = 20$. In that case, in the first week, revenues were $10(20) = \$200$. The following week, she sold 5 ($10 - 50\% = 10 - 5$) copies for \$16 ($20 - 20\% = 20 - 4$) each, for a total sale of $5(\$16) = \80 . All told, revenues were $\$200 + \$80 = \$280$. The choice that works out to \$280 when $x = 10$ and $y = 20$ is correct. As xy appears in all the choices, it's worth noting

6. EXPLANATIONS

that $xy = 200$, so only (D) and (E) are possibilities, as they are the choices that will result in answers greater than \$200.

(D): $1.1(200) = \$220$. Nope.

(E): $1.4(200) = \$280$. That's it.

13. A

Explanation: If the numbers of employees in the five departments are consecutive odd numbers, they are two apart, which means they can be expressed algebraically as follows:

$$x, x + 2, x + 4, x + 6, x + 8$$

The total number of employees, which we can set equal to 75, is this:

$$x + x + 2 + x + 4 + x + 6 + x + 8 = 5x + 20 = 75$$

$$5x = 55$$

$$x = 11$$

The numbers of employees in the two largest departments, then, are equal to $x+6$ and $x+8$, or 17 and 19, respectively. The probability that a given employee works in one of those departments is the sum of the number of employees in those departments divided by the total number of employees:

$$\frac{17+19}{75} = \frac{36}{75} = \frac{12}{25} = \frac{48}{100} = 48\%, \text{ choice (A).}$$

14. C

Explanation: While the question gives us the order of the notebooks, we don't know which one is first. That's the uncertainty that leads to the possibility—but not the surety—that two of the notebooks are purple. For instance, if the first notebook is purple, the eight notebooks are, in order:

PWYOGRBP

In that case, there are two purple notebooks. However, if we start with white, the eight notebooks are:

WYOGRBPW

There are two whites, but only one purple. You may be noticing a pattern: only one color appears twice, and that's the color that appears first. Since there are seven colors and, by extension, seven possible starting colors, and only one way that there will be two purples, the probability is $\frac{1}{7}$, choice (C).

15. D

Explanation: When two six-sided dice are thrown, the number of possible outcomes is 36, the product of the number of possible outcomes (six) for each die. There are six possible ways that the sum of the numbers on the dice is 7:

1 6

2 5

3 4

4 3

5 2

6 1

Thus, the probability of the sum equalling 7 is $\frac{6}{36} = \frac{1}{6}$, choice (D)

6. EXPLANATIONS

A unique characteristic of seven in this context is that, no matter what number comes up on the first die, there is still a possibility of the two dice summing to seven. For that reason, we could look at the question a different way. If we roll the first die, the probability that we could still get a sum of seven is 1. But now that we have a number on the first die, the probability that the second die is exactly the number we need to sum to 7 is $\frac{1}{6}$ —only one of the six possible numbers achieves that goal. The product of the probabilities, then, is $(1)(\frac{1}{6}) = \frac{1}{6}$, the same answer we arrived at before.

16. B

Explanation: If 80% of the drivers who exceed the speed limit are not ticketed, 20% of the drivers who exceed the speed limit are ticketed. If those 20% of the drivers who exceed the speed limit represent 3% of the total number of drivers, we can set up a ratio. On both sides, the numerator of the fraction is the percent of drivers who are ticketed for exceeding the speed limit and the denominator is the total number of drivers who exceed the speed limit. On the left side, those numbers are in terms of the total number of drivers; on the right side, they are in terms of the number of drivers who exceed the speed limit:

$$\begin{aligned}\frac{3}{20x} &= \frac{20}{100} \\ 20x &= 3(100) \\ x &= 3(5) = 15, \text{ choice (B).}\end{aligned}$$

17. C

Explanation: Since the largest and the smallest of the files are increased and decreased by the same amount, the total number of kilobytes in the 100 files doesn't change. Since the number of files doesn't change, either, the mean doesn't change: the sum of terms and number of terms remain the same.

The median also stays the same: in an even number of terms, the median is determined as the mean of the middle two terms. In this case, the middle two terms are unchanged, and they remain the middle two terms, since the two terms that change—the largest and the smallest—remain the largest and smallest, respectively.

The standard deviation does change. Imprecisely (but precisely enough), you can think of the standard deviation as the average difference from the mean. Since two of the terms get farther away from the mean, the standard deviation will increase. (C) is the correct choice.

18. D

Explanation: Call the number of copies sold in the first year x . The number of copies sold in the second year would then be $\frac{1}{6}x$, and the number of copies sold in the third year would be $3(\frac{1}{6}x) = \frac{1}{2}x$. To rephrase the question: x is how many times the average of $\frac{1}{6}x$ and $\frac{1}{2}x$? The average of those two terms is

$$\frac{\frac{1}{6}x + \frac{1}{2}x}{2} = \frac{\frac{4}{6}x}{2} = \frac{2}{6}x = \frac{1}{3}x$$

So, simplifying the question one more time: x is how many times $\frac{1}{3}x$? That's a much more straightforward question: the answer is 3, choice (D).

6. EXPLANATIONS

19. B

Explanation: Since there is no way that Kim (or anyone else) will be selected for more than one task, the question is simpler than it appears. The probability that Kim is selected for any one of the tasks is $\frac{1}{8}$: she is one of the eight possible choices for that task.

Since the probabilities depend on each other—i.e., Kim will not be chosen for B or C if she is chosen for A—we can add the probabilities that she is chosen for each of the three tasks. The probability that she is chosen for one of the three, then, is: $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8}$, choice (B).

20. A

Explanation: In the first 20 minutes, train A travels 20 miles ($\frac{1}{3}$ of an hour at 60 miles per hour), so by the time train B leaves, the distance between them is 200 miles. Trains A & B converge at the rate of their combined speeds, which is $60 + 40 = 100$ miles per hour, which means they cover that distance in $\frac{200}{100} = 2$ hours. In 2 hours, train B, traveling at 40 mph, travels 80 miles, choice (A).

21. A

Explanation: We can divide the 500 people into four categories: people who watch A only, those who watch B only, those who watch both, and those who watch neither. 500 is the sum of those four categories. If we call the number who watched both networks x , the number who watch only B is $3x$, which gives us the following equation:

$$500 = 120 + 3x + x + 220$$

$$500 = 340 + 4x$$

$$4x = 160$$

$$x = 40$$

Since x already represents what we're looking for, the number who watched both networks, (A) is the correct choice.

22. C

Explanation: 20% of 10,000 is $10,000(0.2) = 2,000$, so the value of the account after the first year is $10,000 + 2,000 = 12,000$. 5% of 12,000 is half of 10% of 12,000, or half of 1,200, 600, so the value of the account after the second year is $12,000 - 600 = 11,400$. 10% of 11,400 is 1,140, so the value of the account after the third year is $11,400 + 1,140 = 12,540$, choice (C).

23. B

Explanation: If the ratio of certified to non-certified must be above 9 to 2, the ratio of certified to total must be above 9 to 11. The ratio of certified to total is c (the number of certified teachers, which we don't know) to 600, so we can set up a ratio with the inequality given:

$$\begin{aligned}\frac{c}{600} &> \frac{9}{11} \\ 11c &> 5400 \\ c &> \frac{5400}{11}\end{aligned}$$

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$\frac{5400}{11} \approx 491$, so the maximum number of non-certified teachers the district can employ is $600 - 491 = 109$, choice (B).

24. C

Explanation: If we know the height of the water and the volume of the water, we can find the radius of the base:

$$V = \pi r^2 h$$

$$20\pi = \pi r^2(5)$$

$$r^2 = 4$$

$$r = 2$$

If the tank is half full and placed on its side, the height surface of the water is the radius. Viewed in two dimensions, the water occupies the bottom semicircle of the circle, the height of which is the radius, 2, choice (C).

25. A

Explanation: If 22 percent invest in blue-chip stocks and 12 percent invest in both blue-chips and mutual funds, $22 - 12 = 10$ percent invest in blue-chips but not in mutual funds. The probability of choosing someone from among 10% of the group is 10%, or, in the terms of these answer choices $\frac{1}{10}$, choice (A).

26. B

Explanation: To find Jack's average speed in blocks per minute, we need his total number of blocks traveled and his total number of minutes spent traveling. The total number of minutes is given directly: M minutes walking and N minutes riding a bus, for a total of $M + N$ minutes.

The number of blocks is R blocks walking and $6R$ riding the bus, for a total of $R + 6R = 7R$ blocks. The average speed, then, is $\frac{7R}{M+N}$ blocks per minute, choice (B).

27. C

Explanation: Call X's revenues last year x . Thus, health care expenses last year were $0.15x$. This year's revenues were 20% greater, so revenues were $1.2x$. 10% of that, this year's health care expenses, is equal to $0.12x$. The question, then, is: What percent greater is $0.15x$ than $0.12x$?

Find percent greater by dividing the difference over the original:

$$\frac{0.15x - 0.12x}{0.12x} = \frac{0.03x}{0.12x} = \frac{3x}{12x} = \frac{1}{4} = 25\%, \text{ choice (C).}$$

28. D

Explanation: To simplify the question, eliminate the part of moving 7 consecutive spaces. Since the initial square is chosen randomly and the direction of those 7 squares is chosen randomly, this question is asking the same thing as: "If a game piece is placed on a random square, what is the probability the piece ends no more than 7 spaces from the square numbered 49?"

To answer that question, you need to know how many spaces are no more than 7 spaces from the square numbered 49. The largest numbered square that

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fits that description is $49 + 7 = 56$, and the smallest is $49 - 7 = 42$. Since we're counting all of the squares 42 to 56, inclusive, we find the difference— $56 - 42 = 14$ —and add one, for a total of 15. There are 100 possible squares, so the probability that one of those fifteen is selected is $\frac{15}{100} = 15\%$, choice (D).

29. B

Explanation: To find the number of oranges, we need the total number of pieces of fruit. To do that, we need to find what fraction are represented by the 8 grapes. The fraction is grapes is what's left over after the other fractions given are subtracted:

$$1 - \frac{1}{10} - \frac{1}{5} - \frac{1}{2} = \frac{10-1-2-5}{10} = \frac{2}{10} = \frac{1}{5}$$

If one-fifth of the total is 8 grapes:

$$\frac{1}{5}t = 8$$

$$t = 40$$

If the total is 40, $\frac{1}{10}$ of the total (the number of oranges) is $\frac{1}{10}(40) = 4$, choice (B).

30. D

Explanation: With a number like \$9.9 million, it's a good idea to approximate, even if the question isn't looking for an approximate answer. If the exports of agricultural goods are currently about \$10 million and are predicted to increase by 20%, they are predicted to be a little less than \$12 million.

Similarly, if the exports of industrial goods are current \$24 million and those are predicted to increase by 25%, the resulting number is $24 + 0.25(24) = 24 + 6 = 30$ million. The sum is $12 + 30 = 42$ million, only we rounded first number up a little bit. Thus, the answer should be a little bit less than 42 million, and (D) fits that bill perfectly.

31. D

Explanation: To find the number who didn't answer "no" to both questions, find the number who did, then subtract from 1. The number who answered "no" the the first question is $\frac{3}{4}Y$. If $\frac{2}{3}$ of those answered "yes" to the second question, $\frac{1}{3}$ of them answered "no" to the second question. That number is $\frac{1}{3}(\frac{3}{4}Y) = \frac{1}{4}Y$, which represents the number who answered "no" to both questions. The number that didn't answer "no" to both questions, then, is

$$1 - \frac{1}{4}Y = \frac{3}{4}Y, \text{ or, as it is formatted in (D), } \frac{3Y}{4}.$$

32. A

Explanation: Every 5 minutes, half of the remaining water is removed, so after twenty minutes, half of the remaining water has been removed four times. Mathematically, if we call the original amount of water in the pool x , the remaining amount after 20 minutes is

$$\frac{1}{2}(\frac{1}{2})(\frac{1}{2})(\frac{1}{2})x = \frac{1}{16}x$$

However, the question isn't asking for the remaining amount: it's asking for how much has been removed. That's the difference between 1 and the amount that remains:

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$1 - \frac{1}{16}x = \frac{15}{16}x$, so $\frac{15}{16}$ of the original water was removed, choice (A).

33. E

Explanation: To find a speed $\frac{1}{3}$ slower than another speed, you first need that other speed. If A took 2 hours to fly 360 miles, its speed was $\frac{360}{2} = 180$ miles per hour. $\frac{1}{3}$ slower is $180 - \frac{1}{3}(180) = 180 - 60 = 120$ miles per hour. To find the number of hours, set up the rate formula for B:

$$\begin{aligned} r &= \frac{d}{t} \\ 120 &= \frac{360}{h} \\ h &= \frac{360}{120} = 3, \text{ choice (E).} \end{aligned}$$

34. E

Explanation: Call the capacity of V x . Thus the amount of solution in V is $\frac{2}{3}x$. Since W has 50% more capacity than V, its capacity is $1.5x$. The amount of solution in W, then, is $\frac{3}{4}(1.5x) = \frac{9}{8}x$.

If half of the solution in V— $\frac{1}{2}(\frac{2}{3}x) = \frac{1}{3}x$ —is poured into W, the total amount in W is:

$$\frac{9}{8}x + \frac{1}{3}x = \frac{27}{24}x + \frac{8}{24}x = \frac{35}{24}x$$

Since the capacity of W is $1.5x$, or $\frac{36}{24}x$, the amount in W divided by the capacity of W is:

$$\frac{\frac{35}{24}x}{\frac{36}{24}x} = \frac{35}{36}, \text{ choice (E).}$$

35. C

Explanation: There are three differently-sized faces of the box that the drum's base could be placed on. For instance, if we find the largest possible drum base for the face that is 4 meters by 5 meters, the drum's base has a maximum diameter of 4, which uses the entire width of the shorter of the two sides. The radius is 2, and the maximum height of the drum is the length of the remaining side of the box, 6, so the volume of the resulting drum is:

$$V = \pi(2^2)6 = 24\pi$$

There are two other possible drums. The one where the base is placed on the face with sides 4 and 6 can be ignored: it has the same maximum base size as the previous one, but with a shorter height. There's no way it will be bigger than the first drum we considered.

The other one places the base on the face with sides 5 and 6, and has a height of 4. The maximum radius is 2.5, so the maximum volume is:

$$V = \pi(2.5^2)4 = 4(6.25)\pi = 25\pi$$

That's our biggest possible drum, so it must be the correct choice.

36. B

Explanation: The current ratio is $\frac{3}{5}$, and if we want to express that ratio in terms of an actual number of people, we can call it $\frac{3x}{5x}$, where $3x$ is equal to the number of physics majors. When two of the students change majors, the numerator is decreased by 2 and the denominator is increased by 2:

$$\frac{3x-2}{5x+2}$$

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Since that new ratio is equal to $\frac{1}{2}$, we can set them equal and solve for x :

$$\begin{aligned}\frac{3x-2}{5x+2} &= \frac{1}{2} \\ 5x+2 &= 6x-4 \\ 6 &= x\end{aligned}$$

We're looking for the number of physics majors, which was given by $3x$. Since $x = 6$, $3x = 18$, choice (B).

37. E

Explanation: This question is tailor-made for the overlapping sets formula:

$$T = G1 + G2 - B + N$$

Since we're working with percents, the total number of stocks on the index is 100%. G1 is the number that paid a dividend (60), G2 is the number that increased by 10% or more (55), B is the number that have both of those characteristics (that's what we're looking for) and N is the number that have neither of the characteristics (25):

$$\begin{aligned}100 &= 60 + 55 - B + 25 \\ 100 &= 140 - B \\ B &= 40, \text{ choice (E).}\end{aligned}$$

38. C

Explanation: The current price and number of compact discs that can be bought for \$180 is expressed as:

$$np = 180$$

where n is the number and p is the price per disc, the number we're looking for.

If the price is increased by 2, the number is decreased by 3:

$$\begin{aligned}(n-3)(p+2) &= 180 \\ np-3p+2n-6 &= 180\end{aligned}$$

Using the first equation, in which $n = \frac{180}{p}$, we can reduce this second equation to one variable:

$$180 - 3p + 2\left(\frac{180}{p}\right) - 6 = 180$$

$$\frac{360}{p} - 3p - 6 = 0$$

$$360 - 3p^2 - 6p = 0$$

$$120 - p^2 - 2p = 0$$

$$p^2 + 2p - 120 = 0$$

$$(p-10)(p+12) = 0$$

p must be either 10 or -12, and since we're dealing with prices, the answer must be positive, so it's 10, choice (C).

39. A

Explanation: Call the politician's February approval rating x . If her approval rating decreases by 20%, the rating in April is $x - 0.2x = 0.8x$. If it decreases another 10% by June, the resulting rating is $0.8x - (0.1)(0.8x) = 0.72x$.

The average of her April and June ratings is:

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$$\frac{0.8x+0.72x}{2} = 0.76x$$

To simplify the question: $0.76x$ was what percent of x ? That gives us 76%, choice (A).

40. E

Explanation: In terms of the variables in the table, we're looking for y . We're given three equations:

$$x + y = 33$$

$$y + z = 37$$

$$x + z = 28$$

We can reduce the system to two variables by subtracting the third equation from the second:

$$(y + z) - (x + z) = 37 - 28$$

$$y - x = 9$$

Now we have two equations, this one and the first. To solve for y , add those two:

$$(x + y) + (y - x) = 33 + 9$$

$$2y = 42$$

$$y = 21, \text{ choice (E).}$$

41. D

Explanation: There are four categories that make up the 350 households: those who used A only, those who used B only, those who used both, and those who used neither. 350 is the sum of the four. If we call the number that uses B only $3x$, the number that used both is $2x$. With those variables in place, we can set up an equation:

$$350 = 85 + 3x + 2x + 115$$

$$350 = 200 + 5x$$

$$5x = 150$$

$$x = 30$$

We're looking for the number who used B only, which we called $3x$. Since $x = 30$, $3x = 90$, choice (D).

42. E

Explanation: In the space of the 12 consecutive integers on the cards, you must be able to multiply two of them and get 40, two others and get 72, and two others and get 60. (There can be overlap.) So, determine which numbers you could use to get each of those numbers:

40: 4 and 10, 5 and 8 (1 and 40, and 2 and 20 are too far apart)

72: 6 and 12, 8 and 9

60: 4 and 15, 5 and 12, 6 and 10

Due to 40, there must be at least one number in the deck that is 5 or lower. While, due to 72, one number must be 6 or higher. So, the correct answer is (E), 6: if the smallest numbered card is 6, there's no way for two of the cards to multiply to 40.

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43. B

Explanation: The amount of alcohol in each of the three solutions is given by multiplying the percentage by the number of ounces. For instance, the amount of alcohol in a is $0.01a$, 1% of a . Thus, the total amount of alcohol in the three solutions is:

$$0.01a + 0.03b + 0.06c$$

We also know that the total solution is 2% alcohol, so that's equal to $0.02(a + b + c)$:

$$0.01a + 0.03b + 0.06c = 0.02(a + b + c)$$

Start simplifying by multiplying each term by 100, then isolate a :

$$a + 3b + 6c = 2a + 2b + 2c$$

$$b + 4c = a, \text{ choice (B).}$$

44. C

Explanation: If each machine is required to complete a job in 9 days, the job requires $8(9) = 72$ machine-days. In other words, any number of days and machines that multiplies to 72 will accomplish the task, whether that's 1 machine for 72 days, 72 machines for 1 day, or something else.

The number of days is given, 6, so $6x = 72$, where x is the number of machines necessary to complete the job in 6 days.

$\frac{72}{6} = 12$ machines. That's 4 more than were required to do the job in 9 days, so choice (C) is correct.

45. B

Explanation: Average speed is determined by dividing total distance by total time. We know that total distance is 100 miles (two parts of 50 miles each), but we don't know the total time.

$r = \frac{d}{t}$, so $t = \frac{d}{r}$. For the first 50 miles, the average speed is x mph, so $t = \frac{50}{x}$. For the second 50 miles, the average speed is $2x$ mph, so $t = \frac{50}{2x} = \frac{25}{x}$.

Average speed for the entire trip, then, is $\frac{100}{\frac{50}{x} + \frac{25}{x}} = \frac{100}{\frac{75}{x}} = 100(\frac{x}{75}) = \frac{100x}{75} = \frac{4}{3}x$, choice (B).

46. D

Explanation: There are 3 different compositions of the committee: 3 senior professors, 2 seniors and 1 junior, or 1 senior and 3 juniors. We'll need to compute the number of total possibilities for each of the 3 compositions.

If there are 3 senior professors on the committee, there's only one possible committee: there are only 3 seniors to choose from.

If there are 2 senior professors on the committee, there are 3 groups of 2 senior professors to choose from: each one of the possibilities leaves out one professor, so we can leave out any of the three professors and get a different pair. Those 3 pairs can each be matched up with any of the 6 junior professors, so the number of possible committees with 2 seniors is $3(6) = 18$.

If there is 1 senior, there are 3 possible seniors to choose from. The number of pairs of juniors to choose from is a combinations problem where $n = 6$ and $k = 2$:

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$$\frac{n!}{k!(n-k)!} = \frac{6!}{2!(6-2)!} = \frac{6 \times 5}{2} = 15$$

Thus, there are $3(15) = 45$ possible committees with 1 senior.

The total number of committees is the sum of our three subtotals:

$$1 + 18 + 45 = 64, \text{ choice (D).}$$

47. C

Explanation: If the people were seated in a row, it would be a simple permutations question: the number of arrangements would be $6!$. However, the circular table changes things.

Consider these two possible arrangements in the row:

A B C D E F

D E F A B C

They are distinct arrangements if the people are seated in a row. However, at a circular table, those are same arrangement, just begun from a different point. In fact, for every distinct circular arrangement, you can devise six different row arrangements by starting with any of the six people:

A B C D E F

B C D E F A

C D E F A B

D E F A B C

E F A B C D

F A B C D E

So, start with $6!$ and divide by 6, because that's how many times each row-arrangement is being counted. The result is $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$, choice (C).

48. C

Explanation: The median, in a set with 5 terms, is the middle number. If the largest price is increased and the rest of the prices remain unchanged, the middle number doesn't change, so the median is unchanged, which limits us to choices (A) and (C).

The mean is dependent on the sum of the prices and the number of prices. The number of prices (5) doesn't change, but the sum of the prices does change: it increases by \$1,200. So, the mean increases, and (C) is the correct choice.

49. B

Explanation: If the guard is to check 1 of 5 customers, that's 2 out of the 10 customers that leave the store during his shift. We're looking for the number of possible groups of 2 customers that could've been checked out of the total of 10. That's a textbook combinations problem, where $n = 10$ and $k = 2$:

$$\frac{n!}{k!(n-k)!} = \frac{10!}{2!(10-2)!} = \frac{10 \times 9}{2} = 45, \text{ choice (B).}$$

50. E

Explanation: The maximum number of people of the 60 percent who prefer Monday and Wednesday who can be assigned to Monday and Wednesday is 30 percent. The maximum number of the 40 percent who prefer Tuesday and

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Thursday who could be assigned to those days is 40 percent–70 percent total will be assigned to those days.

Thus, the maximum number that could get their preference is $30 + 40 = 70$ percent. That means the minimum number who will not get their preference is $100 - 70 = 30$ percent.

The tricky part of this question is that the question asks for the number, and the question tells us that there are 200 math majors. 30 percent of the math majors isn't 30, choice (C): it's $0.3(200) = 60$, choice (E).

51. B

Explanation: First, figure out which prime numbers could be the sum of the result of the two dice. The range of possible sums is 2 to 12, inclusive, so the possible prime numbers are 2, 3, 5, 7, and 11. For each one, determine how many different ways the two dice can arrive at that sum:

2: (1,1)

3: (1, 2), (2, 1)

5: (1, 4), (2, 3), (3, 2), (4, 1)

7: (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)

11: (5, 6), (6, 5)

That's a total of 15 ways. There are 36 possible outcomes of rolling two dice: it's the product of the number of possible outcomes for each die. The probability of getting one of these outcomes is $\frac{15}{36} = \frac{5}{12}$, choice (B).

52. E

Explanation: If the fixed costs of operating the flight are \$22,000 and the desired profit is \$16,500, the airline must make the sum of those numbers, \$38,500, from the sale of tickets. If they sell $150 - 40 = 110$ tickets, the minimum selling price per ticket is $\frac{38,500}{110} = \frac{3850}{11} = 350$, choice (E).

53. D

Explanation: There's more information in this question than you need: the fact that the first commercial break consists of 4 advertisements is irrelevant. Instead, focus on what matters. What is the probability that, given a choice of 15 advertisements, X's will be shown among the first 2.

There are two ways in which X's will be shown in the first two: it could be shown first, or second. There are fifteen possible positions in which it could be shown: anywhere from first to last. Thus, the probability is the number of desired outcomes over the number of possible outcomes: $\frac{2}{15}$, choice (D).

54. D

Explanation: Since both Jason and Kylie use a computer for more than 15 minutes and we're looking for the difference in their charges, the \$3.75 charge for the first 15 minutes is irrelevant.

Instead, focus on the difference. Jason used a computer for 30 more minutes. The charge per additional 5 minute period is \$0.50, and 30 minutes is six five-minute periods. That's $6(0.50) = 3.00$, choice (D).

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55. B

Explanation: In the series, if 27 is the eighth smallest number, the smallest number is $27 - 2(7) = 27 - 14 = 13$. We subtract $2(7)$ because each successive number is 2 smaller than the last, and the number of differences of 2 between the eighth smallest and the smallest (or "first smallest") is 7.

Similarly, if 25 is the tenth largest, the largest is $25 + 2(9) = 25 + 18 = 43$. The range is the difference between the largest and smallest numbers in the series: $43 - 13 = 30$, choice (B).

56. B

Explanation: It's not immediately apparent, but we're given two equations in this question. First, we have the volume equation, as we are given the volume of the water:

$$16\pi = \pi r^2 h$$

We're also told that the height of the water in the tank is equal to the diameter of the base. That's the same as twice the radius, so:

$$h = 2r$$

Plug that into the volume equation and solve for r :

$$16\pi = \pi r^2 (2r)$$

$$16 = 2r^3$$

$$r^3 = 8$$

$$r = 2, \text{ choice (B).}$$

57. C

Explanation: When all the measurements shrink by 15%, the range also shrinks by 15%. To see why, consider how range is calculated. If the largest measurement is x and the smallest is y , the range is $x - y$. If x and y are both reduced by 15%, the range is:

$$0.85x - 0.85y = 0.85(x - y)$$

That's 15% less than $x - y$, the original range.

Since the original range was 21, the new range is 15% less than 21. 15% of 21 is a little more than 3, so 15% less than 21 is a little less than 18. Since we're looking for an approximate answer, 18 is close enough: (C) is correct.

58. A

Explanation: To answer the question, we'll need the amount that bond yielded in interest last year. 6 percent of \$5,000 is $0.06(5,000) = 6(50) = 300$. The question, then, is: "What percent of \$5,400 is \$300?"

To answer that, divide:

$$\frac{300}{5,400} = \frac{3}{54} = \frac{1}{18}$$

While $\frac{1}{18}$ is the most reduced fraction, a better way of getting to the answer in this instance is to translate the fraction in another direction:

$$\frac{3}{54} = \frac{6}{108}$$

$\frac{6}{108}$ is less than $\frac{6}{100}$, so it's less than 6%. There's only one choice less than 6%, choice (A).

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59. B

Explanation: Since the routes for A and B are the same, the distances are the same as well. Since distance equals rate times time, rt for A is the same as rt for B:

$$55(16) = 40(t) \\ t = \frac{55(16)}{40} = \frac{11(16)}{8} = 11(2) = 22, \text{ choice (B).}$$

60. B

Explanation: We're given the components necessary to determine a three-part ratio between red, blue, and green cards. However, we can ignore the blue cards entirely: if 3 red equals 5 blue and 9 green equals 5 blue, 3 red equals 9 green. We're looking for the number of red cards that corresponds to a certain number of green cards, so we can focus on the 2-part ratio:

$$\frac{3}{9} = \frac{x}{12} \\ 9x = 12(3) \\ x = \frac{36}{9} = 4, \text{ choice (B).}$$

61. D

Explanation: Using the combined rate formula, we can express the time it would take Y and Z, individually, to fill the order as follows:

$$\frac{1}{Y} + \frac{1}{Z} = \frac{1}{12}$$

In more abstract terms, the question gives us one two-variable equation.

Statement (1) is sufficient: it gives us another two-variable equation. If Z takes twice the time, $Z = 2Y$, which we could combine with the given equation to solve for Y, Z, and their difference.

Statement (2) is also sufficient: it gives us yet another equation. If it takes 12 hours for the two machines to fill the order together and that's $\frac{2}{3}$ the time it would take Y alone, $\frac{2}{3}Y = 12$, or $Y = 18$. Plug that in to the initial equation, and you can solve for Z, then find the difference. Choice (D) is correct.

62. E

Explanation: We know what portions of the legislature support V and X, but we're looking for a number, so at some point, we'll need to convert those percentages to actual numbers of members. Statement (1) doesn't do that: it simply gives us another percent.

Statement (2) gives us a number, but not one we can use. We know the percent of members who support X, but we don't know what percent of those support Z, so we can't relate the number 12 to a percent of anything.

Taken together, the statements are still insufficient. (1) refers to the members who support V, so it doesn't help us relate the 12 members who support X and Z back to the total number, or the total number of members who support Z. Choice (E) is correct.

63. C

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Explanation: Statement (1) gives us an equation with 2 variables: $0.06M + 0.1N = 900$, which represents the amounts of interest earned on the two accounts, as well as the combined interest, 900. We can't solve it for M or N , so we can't compare the amounts of interest earned.

Statement (2) gives us another equation: $0.06M = \frac{1}{2}(0.1N)$. On its own, that has the same problem that (1) does: one equation with two variables. We know the ratio between the interest on M and the interest on N , but we're looking for a dollar figure.

Taken together, the statements are sufficient. Two variables, two equations: you can solve for the amounts of money that were deposited in each of the two accounts, which allow you to find the amount of interest, and compare the two amounts. Choice (C) is correct.

64. B

Explanation: Statement (1) is insufficient: if we want to know how many students are employed, it doesn't matter how many students there are.

Statement (2) is sufficient: it breaks down the population of students into two separate groups, each of which are at least 20% employed. We don't know the relative size of the two sub-groups, but no matter what the ratio is, the percent of employed students must be between 20 and 35 percent, thus at least 20 percent. Choice (B) is correct.

65. C

Explanation: The price of n pounds of meat from this butcher is $y + z(n - 1)$. We can use that formula, rather than plod through the wording again and again, when we look at the statements.

Statement (1) is insufficient: it gives us the equation $16 = y + z(5 - 1)$, or $16 = y + 4z$. Two variables, one equation. Not enough.

Statement (2) is insufficient. It's a little harder to set up as an equation, but we can do it. A customer who purchases one pound of meat is charged y dollars per pound. A customer who purchases two pounds is charged $y + z$, so is charged $\frac{y+z}{2}$ per pound. Thus, $\frac{y+z}{2} = y - 0.5$. Again, it's a two-variable equation.

Taken together, the statements are sufficient. We have two distinct linear equations with the same two variables, so we can solve for the value of y .

66. E

Explanation: Statement (1) is insufficient: we don't know anything about how many students received A's, or how many males received B's or C's.

Statement (2) is insufficient for similar reasons. We can figure out that 40% of the B's and C's were male, but that leaves us with the same problem as (1).

Taken together, the statements are still insufficient. We know that 30% of A's and 40% of B's and C's were male, so the percent of males must be between 30% and 40%, but without knowing the total number of A's or non-A's, we can't figure out the exact percentage. (E) is the correct choice.

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67. D

Explanation: From the question, we know the sum of the numbers of eggs in the two crates is 144, there are 5 broken eggs in the first crate, and there are 4 broken eggs in the second crate.

Statement (1) is sufficient: if the ratios of broken to not broken are the same in both crates, the ratios of broken to total are the same in both crates. $\frac{5}{x} = \frac{4}{y}$, where x and y are the total number of eggs in each of the two crates, and $x + y = 144$. We have two equations with two variables, so we can solve for the values of the two variables, which would, in turn, give us the number of eggs in the second crate that are not broken.

Statement (2) is more straightforward, and also sufficient. We know the number of broken eggs in the second crate, so if we know the ratio of broken eggs to non-broken eggs, we can find the number of non-broken eggs in the second crate, which is what the question asks for. Choice (D) is correct.

68. C

Explanation: Given the actual number of tickets and the ticket price, the total revenues are np , where n is the number of tickets and p is the price of each ticket.

Statement (1) tells us that np is equal to $(n - 100)(p + 6)$, which gives us a single equation with two variables. That's not enough to solve for the value of n .

Statement (2) is similar: it tells us that np is \$1200 more than $(p - 6)(n + 100)$, another two-variable equation that doesn't allow us to solve for the value of n .

Taken together, the statements are sufficient. Given two equations with the same two variables, you can solve for each of the variables. Don't spend the time to do it in this case: it would be time-consuming, and that's not what the GMAT is after.

69. D

Explanation: The question gives you two equations. The first represents the amount of saline in the solution:

$$0.2x + 0.05y = 0.12z$$

The second is the total amount of the solution, since z is the total of the other two amounts:

$$z = x + y$$

To solve a system of equations like this one, you need the same number of distinct linear equations as variables. We have two equations with three variables, so we need one more.

In that light, each statement is sufficient on its own, as each is an equation pertaining to one of those three variables. Given the value of y , you can substitute 16 into the two equations and solve. The same procedure applies to z in statement (2). Choice (D) is correct.

70. C

6. EXPLANATIONS

Explanation: First, find the lowest scores of the students in each class, in terms of the given variables. In first period, the highest score is e and the range is x , so the lowest score is $e - x$. In second period, the highest score is f and the range is y , so the lowest score is $f - y$. The question, then, is asking: "Is $e - x > f - y$?"

Statement (1) is insufficient: it doesn't tell you anything about x and y , which would be necessary to evaluate the inequality.

Statement (2) has a similar problem: nothing about e or f , which are needed.

Taken together, the statements are sufficient. In general terms, you can look at the inequality this way:

Is $e - x > f - y$?

Is $e - x > (\text{greater than } e) - (\text{less than } x)$?

The right side begins with a larger number than the corresponding term on the left side, and subtracts a smaller number. Subtracting a smaller number results in a larger number. So, $f - y$ must be greater than $e - x$, which answers the question. (C) is correct.

71. D

Explanation: To answer the question, you need Y's rate. Statement (1) is sufficient: it gives you Y's rate directly.

Statement (2) is also sufficient. We know X's rate, so if we are given the relationship between X's rate and Y's rate, we can find Y's rate. As in (1), if we have Y's rate, we can find the combined rate of the two machines. Choice (D) is correct.

72. C

Explanation: Statement (1) is insufficient: it gives us the number of rotations per minute, but no way to determine how that relates to 200 meters. It could be that 200 meters takes 1 minute or 1 hour.

Statement (2) is also insufficient: while it gives us the time, it says nothing about the number of rotations in that time.

Taken together, the statements are sufficient. If the wheel rolls the distance in 18 minutes and makes 24 rotations per minute, we can determine how many rotations it made over 200 meters. Choice (C) is correct.

73. C

Explanation: From the question, we can determine the number of male residents of City X. (You don't need to do it, just know that you can.)

Statement (1) is insufficient. The ratio of males born in X to those not born in X is 1:2, which means that $\frac{1}{3}$ of the males in X were born in X. That allows us to determine the number of males born in X (and the number not born in X), but we're looking for the total number, not just males.

Statement (2) is also insufficient, as it relates two quantities we don't know anything about.

Taken together, the statements are sufficient. (1) tells us the number of male residents who were not born in X (among other things), so we can use

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that along with (2) to find the number of female residents who were born in X. Thus, (1) gives us the males born in X and (2) gives us the females born in X, so we can determine the total number of residents who were born in City X. Choice (C) is correct.

74. D

Explanation: The question tells us that $r = s + 3$, where r is the number of rows and s is the number of spaces per row. Using those quantities, the total number of spaces is rs .

Statement (1) is sufficient: it's giving us the total of a parking lot with, in effect, one fewer row. The number of occupied rows is $r - 1$, and we can express the number of spaces per row as $r - 3$, so $(r - 1)(r - 3) = 99$. We don't need to solve that, but after a few moments calculation, you can see that solving for r will result in only one positive value, so you can solve for r and find the value of s .

Statment (2) is also sufficient. This is similar to (1): it's giving us the total if s were one smaller. The number of spaces per row is $s - 1$, and the number of rows is, from the question, $s + 3$. Thus, the total number of spaces is $(s - 1)(s + 3) = 96$. Again, just like (1), we'll find there's only one positive solution for s , so we can find the number of spaces per row. Choice (D) is correct.

75. B

Explanation: This question is tailor-made for the overlapping sets equation:

$$T = G1 + G2 - B + N$$

We're looking for the relationship of B (both, those who work for X and earn \$50,000 or more) and G1, which we'll use to refer to the total number of who work for X. We're already given the total, 35,000 residents, and we can deduce G1, the number who earn at least \$50,000. (40% of 35,000 is 14,000):

$$35,000 = 14,000 + G2 - B + N$$

Statement (1) gives us the value of G2, which isn't either of the terms we're looking for.

Statement (2) gives us the value of B—those who work for X and earn at least \$50,000. We already know that 14,000 of the residents earn \$50,000 or more, so if 1,800 of the residents work for X and earn \$50,000 or more, we can determine what percent of those who earn \$50,000 or more work for X: 1,800 of 14,000. Choice (B) is correct.

76. B

Explanation: Statement (1) gives you an equation using the numbers of shares of X (call it x) and shares of Y (call that y):

$$\frac{x+13}{y} = \frac{3}{2}$$

There's no way to simplify that ratio to the $\frac{x}{y}$ the question is after, so it's insufficient.

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Statement (2) is sufficient: it also gives us a equation. 50% more of X than Y is the same as a ratio of 3 : 2, so the equation looks like this:

$$\frac{1.05x}{y} = \frac{3}{2}$$

Divide each side by 1.05, and you have $\frac{x}{y}$, the ratio of the number of shares that the question is seeking. Choice (B) is correct.

77. E

Explanation: Since we know how many of the first 50 games Team A won (30% of 50 is 15), what we really need to know is how many more games A played after the first 50.

Statement (1) is insufficient: it could mean that A won its last 11 games (after the first 50) or it could be that it won a game, lost a game, and then won the last 10 it played after the first 50. The total number of games could be 60 or 61.

Statement (2) on its own, is also insufficient: since we already know all we need to know about the first 50, it isn't directly helpful.

Taken together, the statements are insufficient. There are two possibilities for games 49 and 50, according to (2). The team must have won one of them, so either it either won 49 and lost 50, or lost 49 and won 50. We can match up those scenarios with the possibilities we deduced from (1):

Won 49 and lost 50: A's last 12 could start with game #50, followed by 11 victories, for a total of 61 games.

Lost 49 and won 50: A's last 12 could start with game #49, followed by 11 victories (including #50), for a total of 60 games.

Those two results give us different numbers of victories (26 and 25), so choice (E) is correct.

78. C

Explanation: The total number of students at the school (which is not given) is the sum of those who study only Russian, those who study only Japanese, and those who study both. We're given the number who do not study Russian, which is the same as the number who study only Japanese.

Statement (1) is insufficient: while there are three variables remaining (we would need two to solve), we're only given the information that 150 do not study Japanese, which means 150 study only Russian.

Statement (2) is also insufficient: again, we need 2 more variables, and we're given one.

Taken together, the statements are sufficient. The following equations sum up the situation:

$$Total = RussianOnly + JapaneseOnly + Both$$

$$400 = 150 + 120 + Both$$

$$Both = 130. \text{ Choice (C) is correct.}$$

79. B

Explanation: Statement (1) is insufficient. It's possible that John has more than 3,000 shares, if for instance he has 3,000 of C, 4,000 of B, and 5,000 of

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A, which leaves 9,000 shares to be divided among the remaining six companies. It's also possible that he has much less – he could have 10 shares or fewer of all seven companies (including C) excepting A and B, which would divide up the vast majority of the nearly 21,000 shares remaining.

Statement (2) is sufficient. It's possible that John would have a very small number of shares – less than 20% greater than the number of the other amounts of shares could be as little as one share, regardless of how the other eight companies' shares are distributed. It's not possible that John would have more than 3,000 shares. 3,000 is 20% greater than 2,500, so if John had 3,000 shares of C, he would have to have 2,500 or more shares of the other 8 companies. That'd be a total of $2,500(8) = 20,000$ shares of the other 8 companies, plus 3,000 shares of C, which is more than the total number we know he has, 21,000. Since 3,000 or more is impossible, he must have fewer than that. Choice (B) is correct.

80. A

Explanation: The question provides several equations:

$$0.4e = m$$

$$0.5e = g$$

$$0.15m = \text{maleGradEcon}$$

We're looking for males with graduate degrees in economics. We could find that if we were given the number of male employees, but we can get that, in turn, from the number of employees. Taking it one step further, if we find out the number of employees with graduate degrees, we can find the number of employees and deduce everything else from there.

Statement (1) is sufficient: given the number of employees with grad degrees, we can find the total number of employees, then the number of males, then the number of males with grad degrees in economics.

Statement (2) is insufficient: we know that 60 percent of the employees are female, but grad degrees in business are irrelevant. Further, we're looking for a number, not a percent, and the question combined with (2) only gives us a series of percents. (A) is the correct choice.

81. E

Explanation: The question tells that $c + x = 25$, where c is the number of compact cars and x is the number of luxury cars. (Better to use x than l .)

Statement (1) introduces a new set of variables, the prices of each rental. If we call the prices of the rentals d and y , we're told that $y - d = 15$. That doesn't help us with the number of cars.

Statement (2) is also insufficient. It combines the number of cars with the prices of the rentals. Using the same variable names from (1), we know that $xy = cd - 105$. Too many variables, not enough information.

Taken together, the statements are still insufficient. Between the statements and the question, we have three equations and four variables. We can't solve for the number of compact cars, so the correct choice is (E).

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82. C

Explanation: As a general framework, it's useful to be thinking of the overlapping sets formula:

$$T = G1(tech) + G2(oil) - Both + Neither$$

With the information we're given:

$$100 = G1(tech) + G2(oil) - 10 + Neither$$

Statement (1) tells that both is $\frac{1}{3}$ of G2 (oil). Since Both is 10% of the total, 30% of the mutual funds must invest in oil stocks. Still, that's not enough to solve for Neither:

$$100 = G1(tech) + 30 - 10 + Neither$$

Statement (2) is similarly lacking. If 35 percent invested in just tech stocks, that number, combined with the 10% that invested in both, gives us 45% that invested in tech stocks altogether. Again, that's not enough:

$$100 = 45 + G2(oil) - 10 + Neither$$

Taken together, we have enough information. With the values of G1 and G2, we can solve for Neither:

$$100 = 45 + 30 - 10 + Neither$$

$$100 = 65 + Neither$$

$Neither = 35$. Choice (C) is correct.

83. B

Explanation: If Tomas's speed was exactly 235 miles per hour, he could fly $235(3) = 705$ miles in 3 hours. So if he flew less than 705 miles, even at his minimum speed, he would make it in less than 3 hours.

Statement (1) is insufficient. We know that if the distance was between 650 and 705, he would take less than 3 hours. But if it was more than 705, it could take him longer than 3 hours, unless he went faster than 235. (That's possible, but we don't know.)

Statement (2) is insufficient. If he flew less than 700 miles, we know he flew less than 705, which was the threshold we established for guaranteeing he would take less than 3 hours. Choice (B) is correct.

84. D

Explanation: The question relates the lengths of the two perimeters. If k is the radius of track K and m is the radius of track M, $2\pi k = 2(2\pi m)$, or $k = 2m$. We're looking for the area of M, so finding the value of m would be sufficient.

Statement (1) is sufficient. It tells us that $\pi m^2 = \pi k^2 - 12\pi$. While algebra doesn't guarantee that two non-linear equations with two variables is sufficient, we don't have to worry about the squared variables because this is a practical geometry problem. There's no way that the radii are negative (since they are physical measurements), so we can solve for the radius of M.

Statement (2) is also sufficient. $2\pi m = 2\pi k - 2\pi$. That's another second equation with the same two variables. Combine it with the question, and you can solve for the radius of M. Choice (D) is correct.

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85. D

Explanation: This is an overlapping sets problem with no "neither" term—that is, none of the 36 total members invest in neither domestic nor foreign stocks. The 8 that do not invest in domestic stocks must invest in foreign stocks only, leaving two variables: the number that invest in foreign stocks only, and the number that invest in both (which is what we're looking for).

Statement (1) is sufficient. If 14 do not invest in foreign stocks, that's 14 who invest in domestic stocks only. The components of the group are given as follows:

$$Total = domesticOnly + foreignOnly + Both$$

$$36 = 14 + 8 + Both$$

$$Both = 14$$

Statement (2) is also sufficient. If 22 members invest in foreign stocks, that's a total of 22 who either invest only in foreign stocks, or who invest in both foreign and domestic stocks. We know that 8 members invest in foreign only, so 14 must invest in both. Choice (D) is correct.

86. E

Explanation: The question gives us an equation like this:

$$Grade = AttendancePoints + k(QuestionsCorrect)$$

where k is the multiplier that affects the number of questions answered correctly. We know that Leandro answered 120 questions correctly, but we don't know the multiplier, or the number of points for attendance.

Statements (1) and (2) are both insufficient: they not only do not relate directly to Leandro's grade, but they give us only one variable each for someone else's grade in this class.

Taken together, they are still insufficient. In Minnie's case, we know that:

$$86 = AttendancePoints + k(112)$$

There are still 2 variables, so we don't know the test question multiplier or the number of attendance points. Without those, we can't calculate Leandro's score. Choice (E) is correct.

87. A

Explanation: Of the marble removals, we know that $b = r + 3$, and we're looking for b .

Statement (1) is sufficient: we know that $\frac{r}{r+b} = \frac{3}{7}$, so we have two linear equations with the variables r and b .

Statement (2) is insufficient. The number of points is given as follows:

$$2b - 2r = 6$$

$$b - r = 3$$

That might look familiar; add r to both sides:

$$b = r + 3$$

It's the same equation, so it doesn't help us answer the question. Choice (A) is correct.

88. B

6. EXPLANATIONS

Explanation: To find the area, we need the height (the given dotted line) and the measurements of the two bases. We have the length of the bottom base, but not enough information to find the top base.

Statement (1) is insufficient, but it does help. Knowing ST, combined with the given length, allows us to use the pythagorean theorem to find the length of SW. However, that doesn't give us the entire length of RS unless we knew the figure was symmetrical, which we don't.

Statement (2) skips over the details of (1), and gives us the measurement we need, of RS. With that length, we have the two bases and height we need to calculate the area of the figure. Choice (B) is correct.

89. E

Explanation: If the bill is less than \$60, as in statement (1), the tip certainly could be greater than 15 percent. For instance, if the bill was \$20, she would calculate the tip as \$2 (the tens digit) + \$3 = \$5, which is 25 percent of 20. The test is whether the tip is still greater than 15 at extremes such as \$29, \$39, or \$49. At \$49, the tip she calculates would be \$4 + \$3 = \$7, which is $\frac{1}{7}$, or approximately 14%, of the amount. That's less than 15 percent, so it's insufficient.

Statement (2) is also insufficient. If the tip is \$8, that means the tens digit was \$5, so the bill must be between \$50 and \$59.99. At \$50, \$8 is $\frac{8}{50} = \frac{16}{100} = 16\%$. At \$60 (really \$59.99, but close enough for these purposes), \$8 is $\frac{8}{60} = \frac{2}{15} \approx 13\%$.

Taken together, the statements are still insufficient. We know that the range from \$50 to \$59.99 includes "yes" and "no" answers, and both statements allow for that entire range. (E) is the correct choice.

90. B

Explanation: Statement (1) is insufficient. We can determine the number of math majors who are not planning on graduate school, but that's all.

Statement (2) is sufficient: if 460 of the math majors have a second major and 210 of those are planning on going to graduate school, that leaves 250 who have a second major and are not planning on graduate school, which is what the question asks for. Choice (B) is correct.

91. E

Explanation: Statement (1) is insufficient. If the dealership has 45 of one model, that leaves 35 for the other 5 models, the greatest number of which are Model A's. Those could be distributed 5, 6, 7, 8, 9, in which case there aren't 12 Model A cars, but they could also be distributed 2, 6, 7, 8, 12, in which case there are.

Statement (2) is also insufficient. Both of the scenarios laid out in the explanation for (1) involve fewer than 15 Model A cars, and give contradictory answers.

Taken together, the statements are still insufficient. (2) doesn't add any information to the contradictory answers that (1) leads to, so it doesn't help answer the question. Choice (E) is correct.

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92. D

Explanation: The question gives you several equations:

$$0.2m = \textit{percussion}$$

$$0.5m = \textit{since1995}$$

$$0.3(\textit{since1995}) = \textit{brassSince1995}$$

All of those are given in percentage terms, but we're looking for an actual number: how many have been in the band since '95 and play brass instruments. If we're given any of the variables—number of musicians, number of percussionists, or number who have been in the band since 1995—we can use those equations to find the number we're looking for.

Statements (1) and (2) are both sufficient on their own. Each one gives one of the variables that allows us to solve for the number of brass players who have been in the band since 1995. The number we're looking for is 30% of the number who have been in the band since 1995 (statement (1)), and the number of percussion players give us the number of musicians, which in turn allows us to solve for the number who have been in the band since 1995. Choice (D) is correct.

93. C

Explanation: To determine the number of liters of water in this three-part solution, you need to know what amount of the solution (or what proportion, since we are given the total amount) is made up of vinegar and alcohol.

Statement (1) doesn't provide that: the ratio of water to vinegar is helpful, but without knowing how alcohol fits into the picture, we can't answer the question. Statement (2) has a similar problem: it gives us the relationship between vinegar and alcohol, but nothing about their relationship with water.

Taken together, the statements are sufficient. Between the question and the two statements, we have three equations involving the three variables:

$$x + y + z = 4$$

$$\frac{x}{y} = \frac{4}{1}$$

$$\frac{y}{z} = \frac{3}{1}$$

With three distinct linear equations and three variables, we can solve. (C) is correct.

94. A

Explanation: From the information given in the question, you could determine the value of n : you could figure out what percent \$4,000 must be invested at to yield \$300. To answer the question, you need the value of x .

Statement (1) gives you a relationship between n (which you already know) and x (which you need to know), so you could solve for x , and thus solve the problem.

(2) is not sufficient: you could figure out the value of n from the information in the question, so (2) doesn't help at all. Choice (A) is correct.

95. B

6. EXPLANATIONS

Explanation: Statement (1) is insufficient. If 40 museums are open both days, and 20 percent of the museums that are open on Mondays are open on Tuesdays, that means that 40 is 20 percent of the number that is open on Mondays:

$$40 = 0.2m$$
$$m = \frac{40}{0.2} = \frac{400}{2} = 200$$

There are at least 50 open on Tuesdays, so we don't know whether that number is larger than 200.

Statement (2) is sufficient. The number of museums open on both days—whatever that number is, let's call it b —is 20 percent of the number that is open on Mondays. So the number open on Mondays is:

$$m = \frac{b}{0.2} = 5b$$

30 percent of those open on Tuesdays are open both days, so:

$$t = \frac{b}{0.3} = \frac{10b}{3}$$

In terms of b , the number open on Mondays is greater. Choice (B) is correct.

96. D

Explanation: We're given the relationship that $r = c + 1$. Statement (1) is sufficient: the total number of chairs is rs , so $rs = 30$. Combine that with the given information, and we can solve for c .

Statement (2) is also sufficient. If 9 chairs are left after removing one chair, 10 chairs were there to begin with. Since there is an equal number of chairs in each row, that means that 5 chairs are in each row. Choice (D) is correct.

97. E

Explanation: Statement (1) gives us a series of variables: $t_{bruce} = t_{quentin} + 2$, and $r_{bruce} = r_{quentin} - 10$. To compare their distances:

$$d_{bruce} = (r_q - 10)(t_q + 2) = r_q t_q - 10t_q + 2r_q - 20$$

$$d_{quentin} = r_q t_q$$

Without knowing the actual time and rate, we can't compare Bruce's and Quentin's distances.

Statement (2) is insufficient, as it only gives us information about one of the drivers. However, it's more concrete data: Nory's distance was 650 miles.

Taken together, the statements are still insufficient. Since Nory drove 650 miles, that leaves 1350 for the other two:

$$1350 = r_q t_q - 10t_q + 2r_q - 20 + r_q t_q$$

We're left with two variables in one equation. We're not going to find Bruce's or Quentin's actual speeds, times, or distances, so (E) is correct.

98. A

Explanation: Statement (1) is sufficient. If all of the terms in a set, such as the populations in this example, increase by an equal percent, the standard deviation increases by that percent as well. Thus, the standard deviation in 1997 is 15% greater than 8 million.

Statement (2) is insufficient: the arithmetic mean is not enough information to find the standard deviation, especially since we know nothing about the

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relationship of that mean (and the other measurements) to the mean in 1987. Choice (A) is correct.

99. E

Explanation: Statement (1) gives you a relationship between the times required, which isn't enough to give you an actual number of hours. However, you can deduce an equation: $t_X = 1.25(t_Y)$.

Statement (2) gives you another relationship; again, it's not enough to give you a number of hours. This equation is: $0.5t_Y = 0.4(t_X)$.

Taken together, the statements are still insufficient. The equations given are the same:

$$0.5t_Y = 0.4(t_X)$$

$$t_Y = 0.8(t_X)$$

$$t_X = \frac{t_Y}{0.8} = \frac{t_Y}{\frac{4}{5}} = t_Y\left(\frac{5}{4}\right) = 1.25(t_Y)$$

Choice (E) is correct.

100. C

Explanation: Statement (1) is insufficient: 25 of the rats developed sluggishness, a skin rash, or both, but we don't know the breakdown of those groups.

Statement (2) is also insufficient: If 15 rats developed a skin rash, we don't know how many of the other 185 developed sluggishness.

Taken together, we have enough information. If 25 rats developed one of the two symptoms and 15 developed a skin rash, 10 did not develop a skin rash. We're looking for the number that developed one of the symptoms (sluggishness) but not a skin rash, so that's our answer. Choice (C) is correct.